

WHAT IS CLAIMED IS:

1. A hazard atlas of a disorder in a tissue comprising an image of the tissue, wherein the image comprises a plurality of voxels, each voxel representing a hazard value of an extent of deficit caused by damage from the disorder to that voxel of tissue at that location.
2. The hazard atlas of claim 1, wherein the hazard value of each voxel is based on any one or more of anatomical, vascular, and functional regions of tissue scored according to a specific numerical rating scale.
3. The hazard atlas of claim 1, wherein the hazard value of each voxel is based on patient images and recorded patient behavior and outcomes.
4. The hazard atlas of claim 1, wherein the tissue is brain, and the hazard value for each voxel is determined by analyzing a set of images from a group of patients that correlates damage in a specific region of the brain with a degree of loss of function and wherein the hazard value is commensurate with the degree of loss of function.
5. The hazard atlas of claim 1, further comprising a scale that correlates the values of the voxels to a code.
6. The hazard atlas of claim 5, wherein the code is color.
7. The hazard atlas of claim 5, wherein the code is a series of numbers.
8. The hazard atlas of claim 5, wherein the code is a gray scale.
9. The hazard atlas of claim 1, wherein the hazard atlas comprises digital data and is stored on a computer-readable medium.

10. The hazard atlas of claim 1, wherein the image of the tissue is a three-dimensional image.

11. The hazard atlas of claim 1, wherein the tissue is brain.

12. The hazard atlas of claim 11, wherein the disorder is stroke.

13. A system for determining a hazard score for a patient having a disorder in a tissue, comprising

a device arranged to obtain or store an image of the patient's tissue, wherein the image comprises a plurality of patient image voxels;

a memory or computer-readable medium storing a hazard atlas of a disorder in the tissue, wherein the hazard atlas comprises a plurality of voxels, each voxel representing a hazard value of an extent of deficit caused by damage from the disorder to that voxel of tissue at that location;

an output device; and

a processor linked to the imaging device, memory, and output device, wherein the processor is programmed to

(i) obtain the image of a tissue of the patient;

(ii) identify voxels of the patient image that are damaged by the disorder as damaged patient image voxels;

(iii) obtain from the memory or computer-readable medium the hazard atlas of the disorder in the tissue;

(iv) compute a hazard score for the patient, wherein the score is the integration of all damaged patient image voxels weighted by a hazard value corresponding to that voxel location; and

(v) transmit the hazard score to the output device.

14. The system of claim 13, wherein the device to obtain the image of the patient's tissue is a magnetic resonance imaging device.

15. The system of claim 13, wherein the hazard atlas is an atlas of the brain affected by stroke.

16. The system of claim 13, wherein the hazard atlas comprises a scale that correlates the values of the voxels to a code.

17. The system of claim 13, wherein the hazard score is computed using the formula:

$$\text{Hazard Score} = \sum_{j=1}^{N2} \sum_{i=1}^{N1} \text{NIHSS}_{ij} / \text{volume}_i \cdot \text{infarct_voxel}_j$$

where N1 is the number of outlined regions and N2 is the total number of infarct voxels.

18. The system of claim 13, wherein damaged patient image voxels are identified using an image segmentation method.

19. The system of claim 13, wherein the image of a tissue of the patient comprises a series of images to represent a three-dimensional image.

20. A method for determining a patient's hazard score for a disorder in a tissue, the method comprising:

obtaining an image of a tissue of the patient, wherein the image comprises a plurality of patient image voxels;

identifying voxels of the patient image that are damaged by the disorder as damaged patient image voxels;

obtaining a hazard atlas of the disorder in the tissue; wherein the hazard atlas comprises a plurality of voxels, each voxel representing a hazard value of an extent of deficit caused by damage from the disorder to that voxel of tissue at that location; and

computing a hazard score for the patient, wherein the score is the integration of all damaged patient image voxels weighted by a hazard value corresponding to that voxel location; wherein the hazard score determines the patient's prognosis.

21. The method of claim 20, further comprising matching the patient image to a standardized set of anatomical images of that tissue to provide a standardized image.
22. The method of claim 20, further comprising determining a course of treatment based on the hazard score.
23. The method of claim 20, wherein the tissue is brain tissue.
24. The method of claim 23, wherein the disorder is stroke.

25. A method for determining the efficacy of a treatment method for a patient having a tissue disorder, the method comprising

- administering a treatment to the patient;
- measuring a hazard score using the method of claim 20 at two or more points in time after administering the treatment; and
- determining the efficacy of the treatment based on the hazard scores.

26. A method of generating an expert hazard atlas, the method comprising:

- identifying one or more of anatomical, vascular, and functional regions on a standard set of anatomical images of a tissue;
- assigning weighting factors to the regions according to clinically-relevant assessment methodologies; and
- generating an expert hazard atlas of the tissue comprising a plurality of voxels based on the weighting factors for each voxel in the atlas.

27. A method of generating a data-driven hazard atlas, the method comprising:

- acquiring patient image data;
- matching patient image data to a standardized set of anatomical images;
- identifying regions of the patient's tissue with damage based on the image data;
- assigning weighting factors to the regions based on actual patient outcome data; and

generating a data-driven hazard atlas of the tissue comprising a plurality of voxels based on the weighting factors for each voxel in the atlas.

28. A computer program for determining a hazard score of a patient having a disorder in a tissue, the program residing on a computer-readable medium and comprising instructions for causing a processor to:

- (a) obtain an image of a tissue of the patient, wherein the image comprises a plurality of patient image voxels;
- (b) identify voxels of the patient image that are damaged by the disorder as damaged patient image voxels;
- (c) obtain from a memory or computer-readable medium a hazard atlas of the disorder in the tissue, wherein the hazard atlas comprises a plurality of voxels, each voxel representing a hazard value of an extent of deficit caused by damage from the disorder to that voxel of tissue at that location;
- (d) compute a hazard score for the patient, wherein the score is the integration of all damaged patient image voxels weighted by a hazard value corresponding to that voxel location; wherein the hazard score determines the patient's prognosis; and
- (e) transmit the hazard score to an output device.